

# Cognitive Problems in Systemic Lupus Erythematosus

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# What I hope you'll be able to do after this seminar:

## GOALS:

1. Discuss the types of cognitive problems that patients experience and how those problems are related to the functioning of different brain networks and systems.
2. Explain the process of neuropsychological evaluation and describe how it may be helpful for an individual who is dealing with cognitive symptoms.
3. Describe the (limited) understanding regarding the nature and causes of these problems.
4. Provide suggestions for coping with these problems on a day-to-day basis.

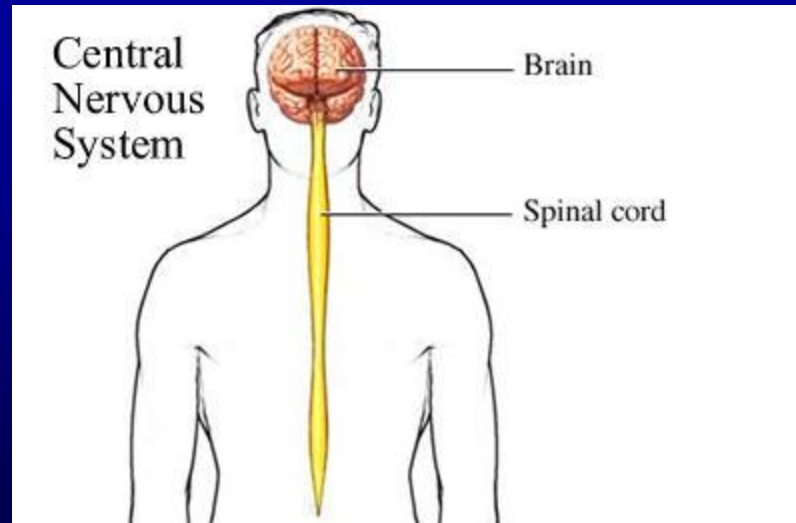
# How we're going to get there:

## OUTLINE

1. What is Lupus and how does it affect the brain?
2. Which cognitive functions are most likely to be effected?
3. What is neuropsychological evaluation and when is it helpful?
4. What treatments are available for the cognitive symptoms of Lupus?

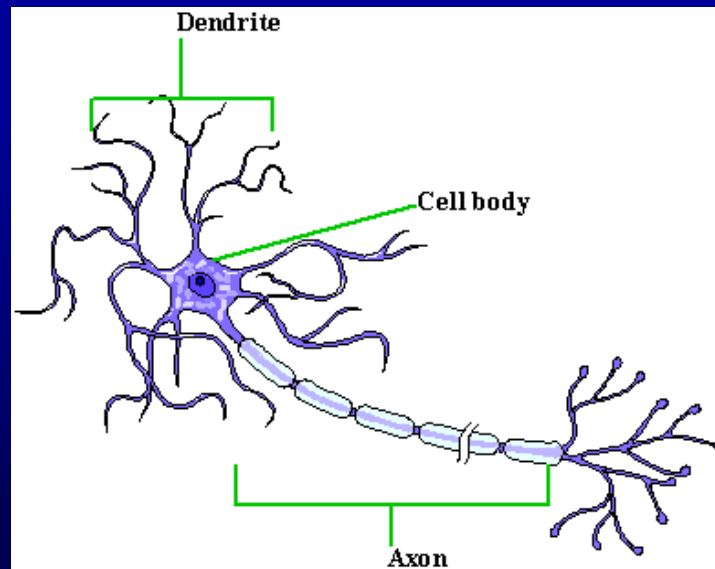
# Central Nervous System (CNS) effects of Lupus

- Lupus is an auto-immune disorder in which multiple systems throughout the body are effected
- Can include the CNS – meaning the brain and spinal cord



# How is the brain affected by Lupus?

- The mechanisms by which Lupus affects the CNS are poorly understood:
  - Primary: The abnormal immune cells/chemicals may interfere with the efficient functioning of neurons and their connections



# How is the brain affected by Lupus?

## – Secondary

- Lupus damages blood vessels that supply the brain cells with oxygen and nutrients.
- Treatments for Lupus are sometimes associated with cognitive problems (e.g., steroids, immunosuppressants)
- Other organ damage (kidney, heart) leading to brain injury
- Opportunistic infections

# How is the brain affected by Lupus?

- Tertiary
  - Pain
  - Fatigue
    - Among the most common symptoms in Lupus
    - Can affect cognition even if no direct involvement of CNS
  - Depression
    - Causes problems with attention and memory
    - Can occur in anyone, but when combined with other Lupus symptoms can be more detrimental to cognitive function.

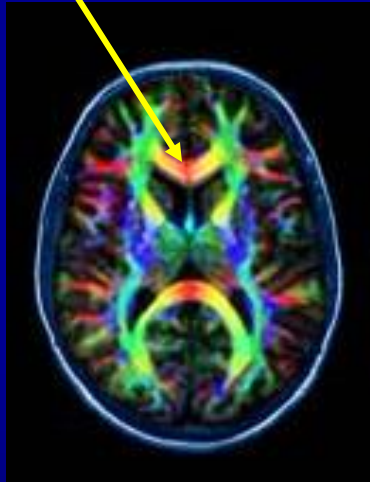
# Areas of the brain affected by Lupus

- Because of the multiple possible mechanisms, different areas can be affected in different people
- Common sites:
  - White matter
  - Basal Ganglia
  - Cortex

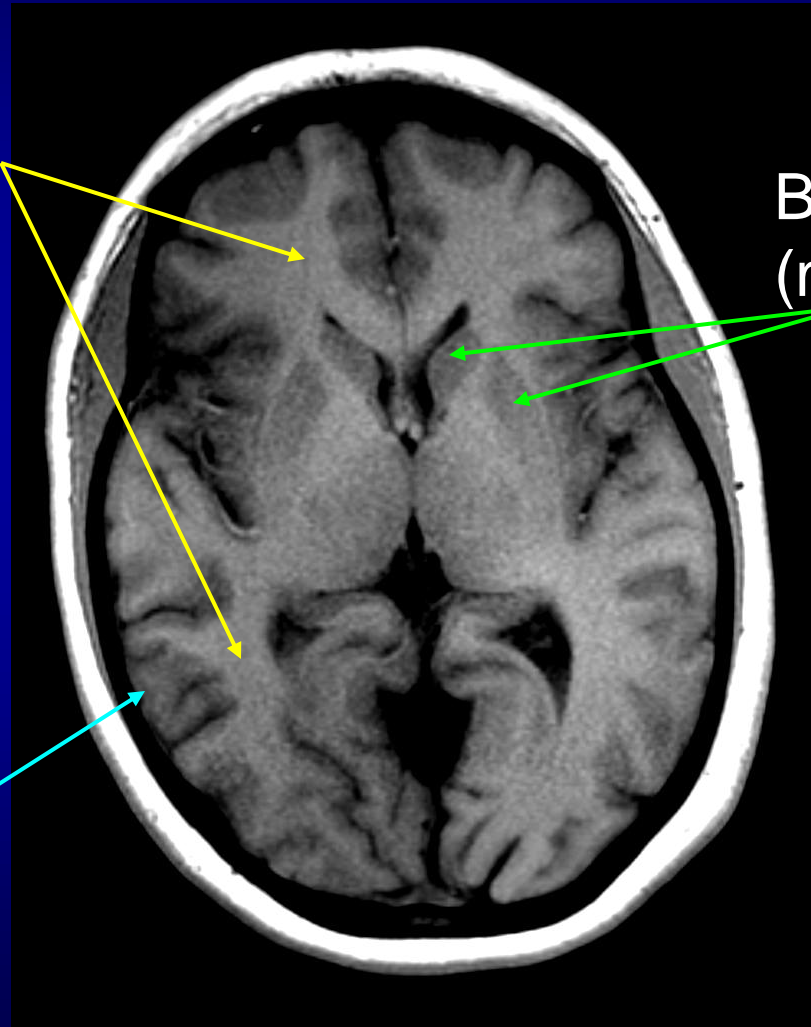


# Areas of the brain affected by Lupus

White matter  
(axons: neural  
transmission)



Basal Ganglia  
(movement control)



Cortex/grey  
matter  
(neuron cell  
bodies)

# Central Nervous System (CNS) effects of Lupus

Percentage of Lupus patients with CNS symptoms:

<b>Any Neurologic Symptom</b>	<b>60</b>
Cognitive disorder	50
Mood disorder	40
Headache	25
Seizures	20
Mono-, polyneuropathy	15
Stroke, TIA	10
confusional state or movement disorder	2-5
Aseptic meningitis, myelopathy	<1

# Cognitive Functions

## What is 'Cognition'

- All of the skills of thought
  - Memory
  - Concentration
  - Language Skills
  - Visual Skills
  - Executive Functions
    - Reasoning & Problem Solving
    - Judgment
    - Impulse Control
    - Flexibility
    - Planning
    - Sequencing and Organizing

# Cognitive functions affected by Lupus

- Most common domains
  - Visuospatial skills
  - Attention
  - Information processing speed
  - Recent Memory
  - “Executive” functions
  - Emotion
- Less common
  - Language
  - Movement disorder (e.g., tremor)

# Measuring cognition: Neuropsychology

“Clinical neuropsychology is an applied science concerned with the behavioral expression of brain dysfunction.”

M. Lezak, *Neuropsychological Assessment*

“A clinical neuropsychologist is a professional psychologist trained in the science of brain-behavior relationships. The clinical neuropsychologist specializes in the application of assessment and intervention principles based on the scientific study of human behavior across the lifespan as it relates to normal and abnormal functioning of the central nervous system.”

From the Houston Conference guidelines

# What does a neuropsychologist do?

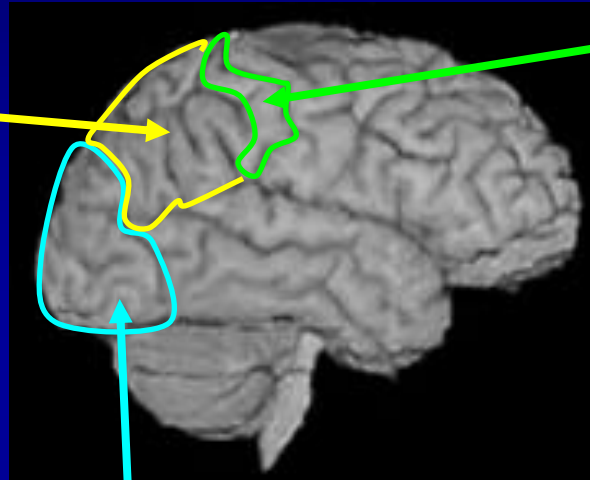
- Nature of a neuropsychological evaluation
  - An interview and examination by the neuropsychologist
  - Administration of standardized tests
  - Those tests are then interpreted in the light of the history information by the neuropsychologist
  - Feedback to the person and their referring doctor

# Cognitive functions of the Parietal and Occipital lobes

Posterior Cortex

Posterior Parietal lobe:  
Complex heteromodal function

- Right: Spatial awareness
- Left: Body awareness, complex language skills
- Attention

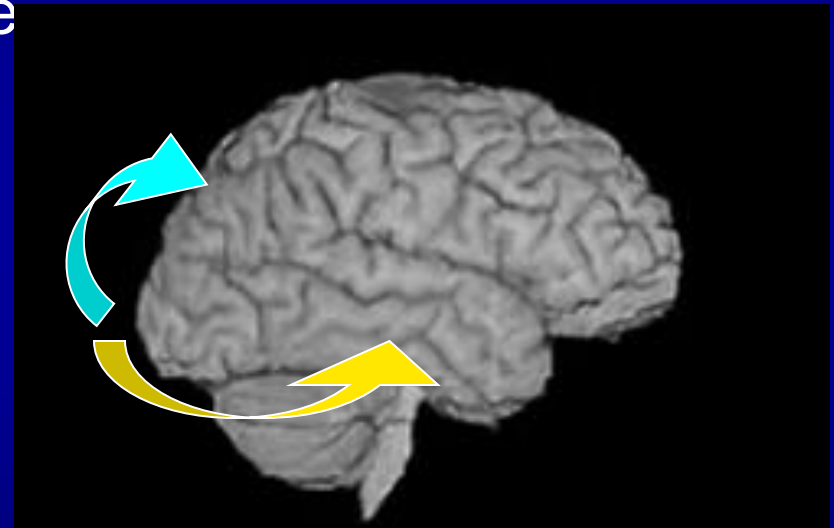


Anterior Parietal lobe:  
•Somatosensory

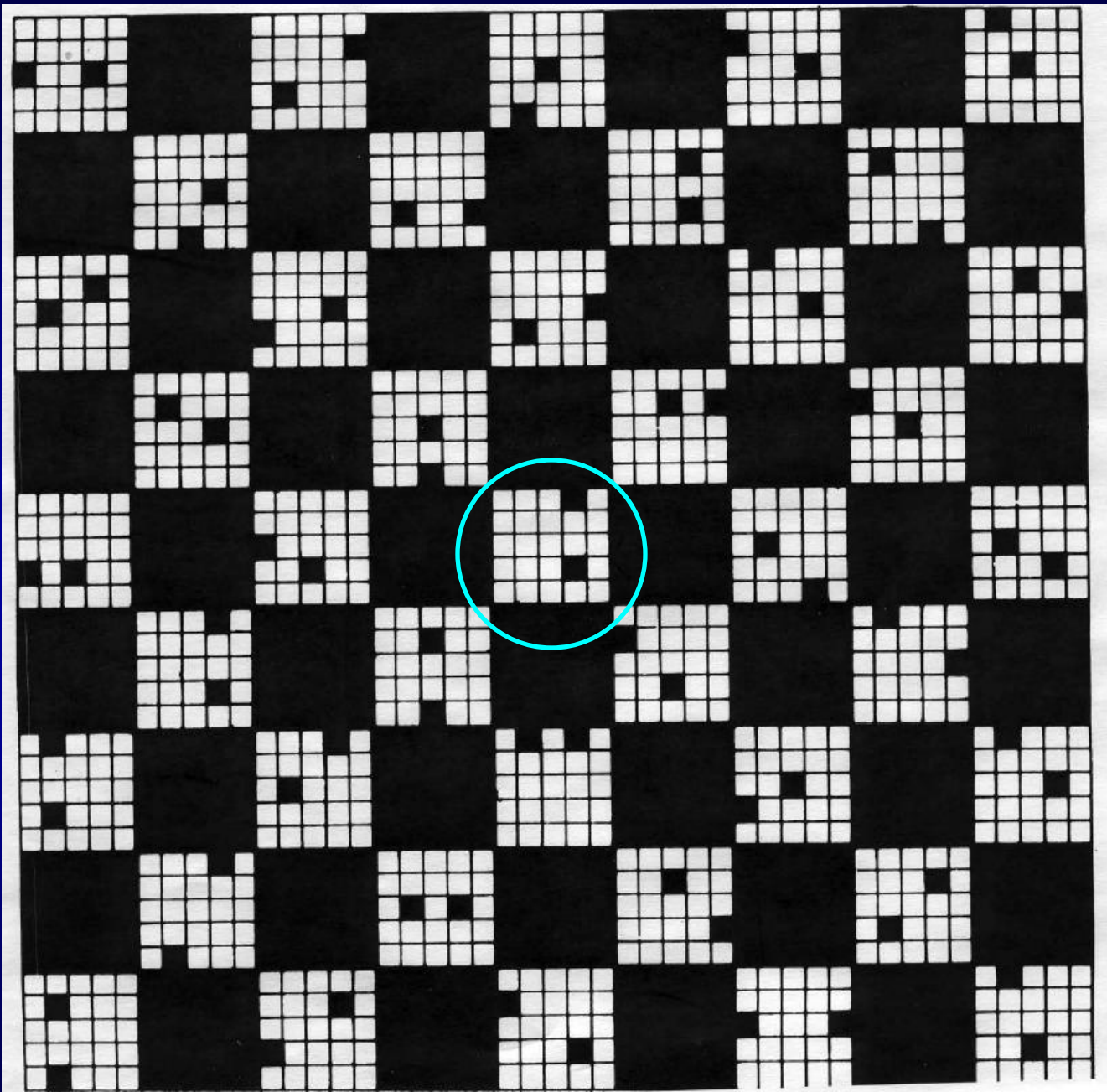
Occipital Lobe: Vision

# Visuospatial functions

- “Where” pathway (blue)
  - Visual search
  - Location of objects in space
- “What” pathway (yellow)
  - Object identification
  - Facial recognition
- Integration/construction
  - Image rotation
  - Drawing
  - Block design









1



2



3



# Attention, Processing Speed & Working Memory

- Attention
  - Sustained Attention
  - Divided Attention
  - Shifting Attention
- Working Memory = mental RAM
  - Information you “hold in mind”
  - Has a maximum capacity
  - Sets limits on amount of material you can process at one time
- Speed of processing is related to attention
  - Processing automatic material is rapid
  - Interference occurs between competing information
  - “Multi-tasking”

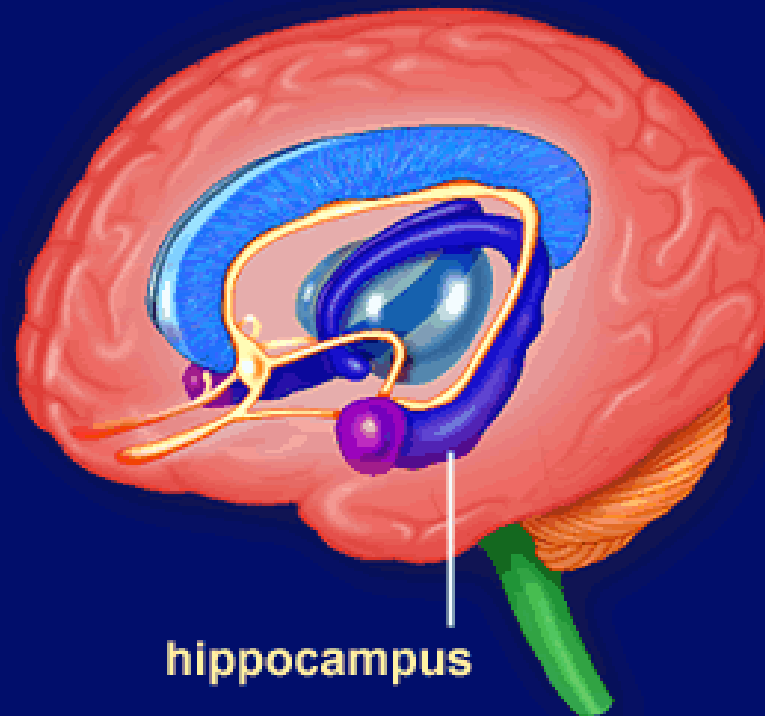
# Memory

## Recent memory:

- Encoding
  - Getting the information in – highly related to attention
  - Depends on focus and processing speed
- Storage (Consolidation)
  - Free recall of information after a delay/distractor interval
  - % retention
  - Depends on hippocampus
- Retrieval
  - Use recognition paradigm (yes/no) to disentangle retrieval from consolidation based memory deficits.

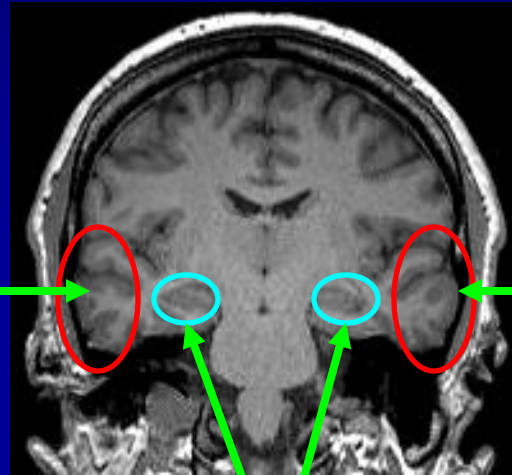
# Memory

Recent memory



# Common cognitive problems associated with focal brain lesions

## The Temporal Lobes



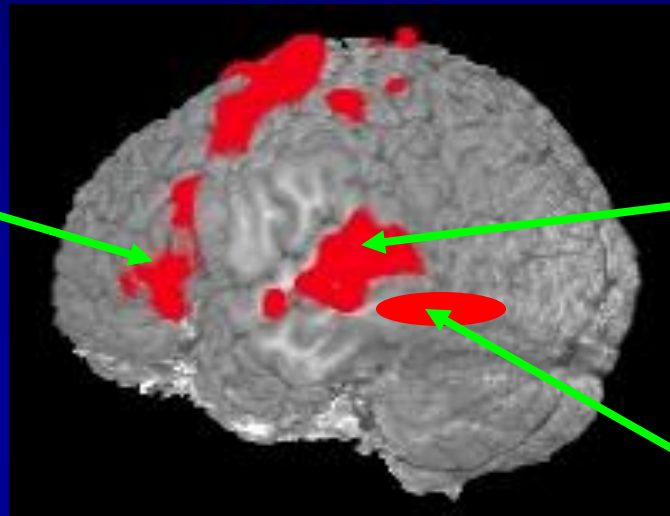
Right: Visual/Spatial skills

Left: Language  
(see next slide)

Medial/Hippocampus:  
Recent memory

# Left Temporal and Frontal lobes: Language

Speech Production  
(Broca's area)



Language Comprehension  
(Wernicke's area)

Reading & Writing

- Word recognition
- Comprehension
- Spelling

Word Finding Difficulties:

- The most common speech/language problem
- Can occur with lesions anywhere in this territory

# Executive functions

- “Frontal lobe” tests
- Reasoning & problem solving
- Inhibition
- Shifting
- Initiation, cessation, perseveration
- Requires integration of other domains, efficiency
- Other qualitative executive skills
  - Awareness/insight
  - Judgment





# Stroop Color Word Test

read word

Red	Green	Blue
Blue	Red	Green
Green	Red	Blue
Blue	Green	Blue
Red	Red	Green
Red	Blue	Red
Green	Blue	Blue



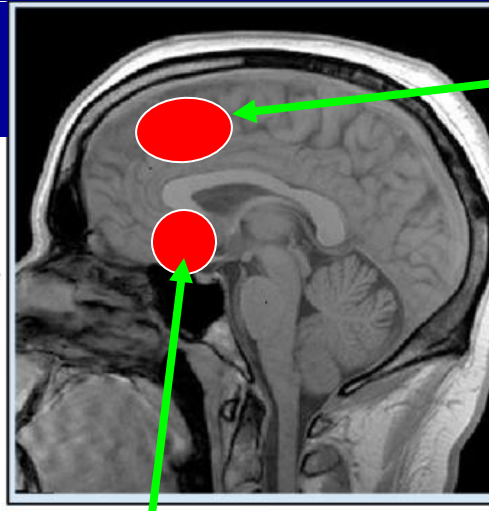
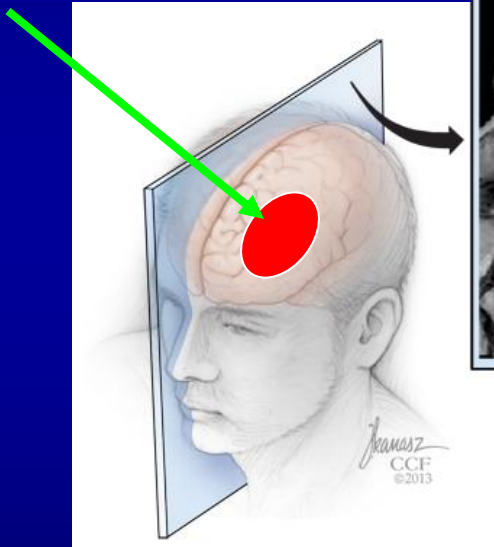
# Name color of font

Red	Green	Blue
Blue	Red	Green
Green	Red	Blue
Blue	Green	Blue
Red	Red	Green
Red	Blue	Red
Green	Blue	Blue

# Cognitive problems associated with problems of the frontal lobes

## The Frontal Lobes: Executive Functions

Lateral prefrontal cortex:  
Attention, memory, reasoning



Medial frontal lobes:  
Apathy  
Loss of initiation

Orbitofrontal/Basal Forebrain:  
Memory Impairment  
Poor Judgment  
Behavior change (inappropriate / disinhibited)

# Mood and emotion

- Feelings of depression and anxiety are more common for people with Lupus than the general population
- Some of this is due to normal reactions to the consequences of illness (pain, fatigue, other symptoms)
- Could some be due to changes in brain systems that control emotions?
  - No good studies yet
- Evaluation involves an interview/discussion and filling out some questionnaires about feelings

# How is a neuropsychological evaluation helpful?

- Can help to understand the *nature* of a cognitive problem
  - Cause(s)
  - Which cognitive abilities are at fault (e.g., attention vs memory)
- Can help to rule out other issues that may be of concern
- Can help you to understand your cognitive problems
- Can guide treatment
- Establish a baseline for evaluation of treatment
- Document cognitive symptoms for other purposes
  - Educational accommodations
  - Disability

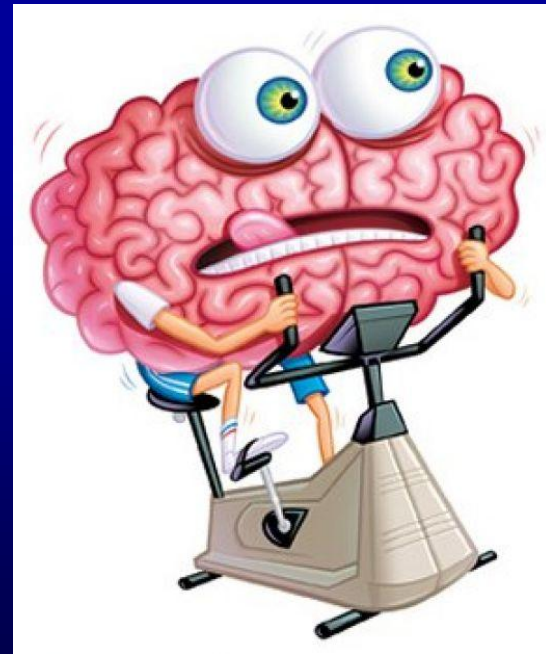
# Treatments for Cognitive problems in SLE

## Medications

- Attention enhancers (e.g., Ritalin, Provigil, etc)
  - These medications can improve attention, alertness, arousal
  - Must be used carefully, as they can interact with neural systems affected by Lupus
  - N-Acetylcysteine has been shown to reduce self-report of attention problems
- Memory enhancers (Aricept, Namenda, etc)
  - Have been used primarily in other neurologic disorders, such as Alzheimer's Disease
  - Aricept has not been studied in Lupus to my knowledge
  - Namenda was evaluated and found not to produce any cognitive improvement in a small study

# Maintaining Brain Health

- Does brain 'exercise' help?
  - It's better than nothing...
  - ...but not necessarily better than anything else
  - Buyer beware



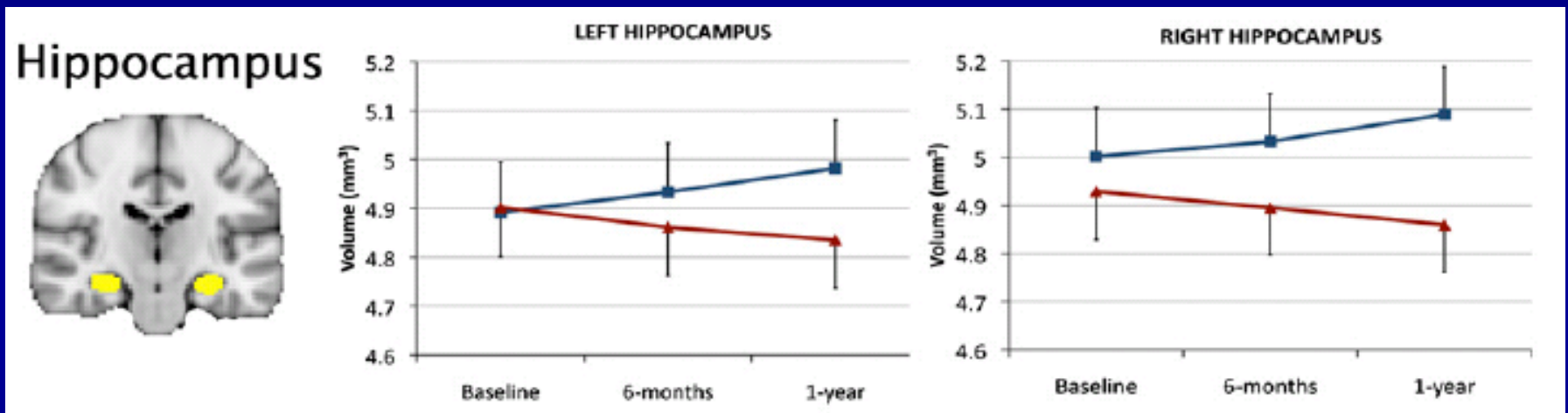


# Maintaining Brain Health

- Physical exercise
  - Helps promote overall brain health
  - Improves blood flow to the brain
  - Can help reduce the loss of brain with aging
- Talk to your doctor about the level of exercise that is safe
  - general guidelines are similar to those for heart health

# Maintaining Brain Health

- The value of exercise

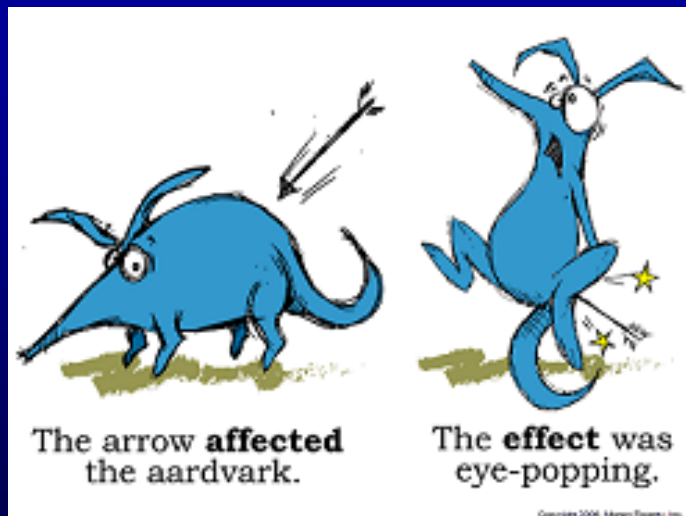


# Maintaining Brain Health

- Cognitive Rehabilitation
- Compensatory strategies are most effective method
  - Identify the goal you'd like to achieve or the thing you'd like to do better.
  - Work with someone to develop a strategy to achieve that goal
  - Cognitive rehabilitation specialists
    - Speech therapy
    - Occupational therapy

# Maintaining Brain Health

- Cognitive Rehabilitation example:
- A mnemonic strategy to help with learning and retention
  - Whether to use “affect” or “effect” in a sentence
  - A Very Easy Noun – “Aardvark”
  - Affect Verb: Effect Noun



# Summary

- Cognitive problems occur frequently in SLE
- May be caused directly by the disease itself, or as a consequence of other factors
- Neuropsychological evaluation is a useful way to understand the cause of a cognitive problem and develop strategies to deal with it
- Treatment for cognitive problems may involve medications and/or rehabilitation strategies
- Maintaining good general brain health may provide some resiliency, though physical and cognitive activity

## Questions?